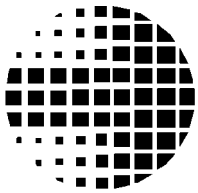
DPS-235

Operators Manual



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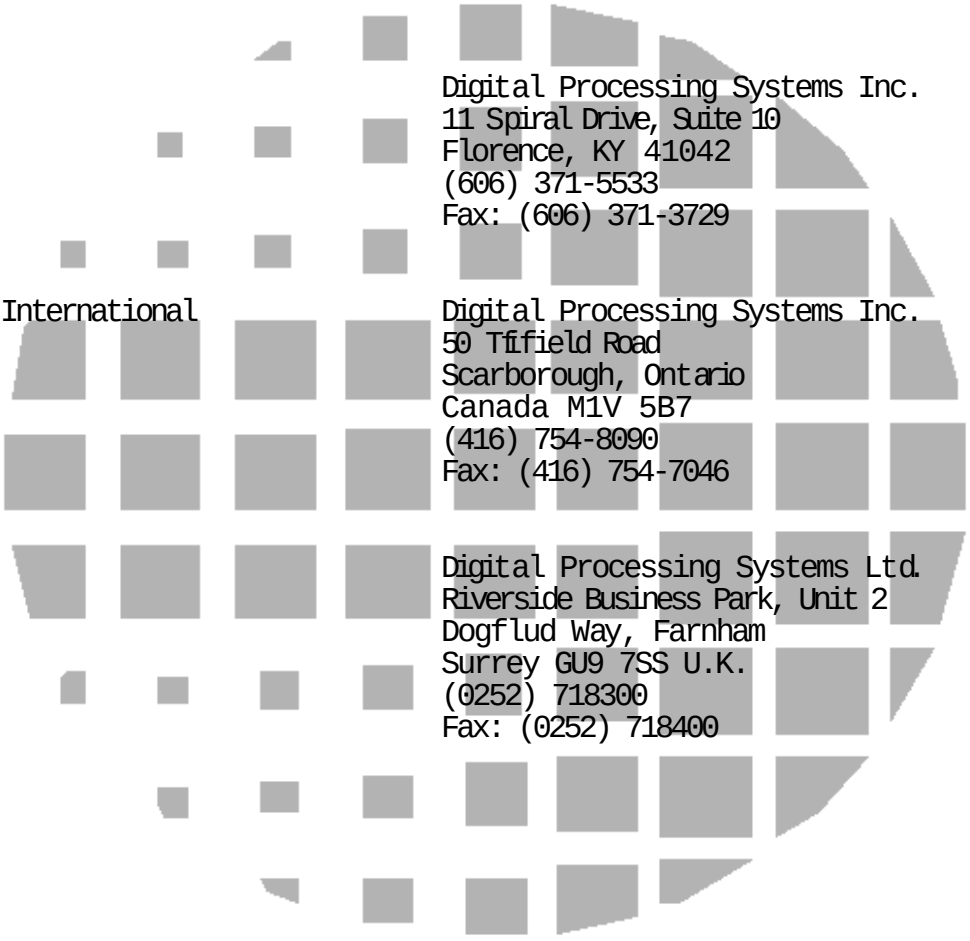
This product requires technical and mechanical ability and requires precautions against electrostatic discharge. The user assumes all risks when this product is assembled by anyone other than an authorized Digital Processing Systems dealer.



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Digital Processing Systems

Bulletin Board System

For DPS customers with modems, software upgrades and new product information is available by calling our Bulletin Board System at (416) 754-8368. The settings in your favorite communications package should be set as follows:

Speed	up to 14,4000 bps
Terminal Type	VT-102/ANSI

New callers will be asked to answer a short questionnaire. After answering all questions, you may choose to read the Bulletins and Newsletter or go directly to the file transfer menu and download the required file(s).

The BBS contains extensive help files should you have difficulty using the system. Otherwise, please refer questions on using your modem to the organization where you purchased your communications software or your local dealer.

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CHAPTER 1

Introduction

DPS-235 General Description

The DPS-235 is a broadcast quality rackmount dual channel TBC. The DPS-235 features both wideband composite (5MHz) and S-Video (S-VHS or Hi8fi) Inputs and outputs. The DPS-235 interfaces virtually any VCR, laser disk player or camcorder to production switchers. Special Features include Rock Solid Freeze (Both Field and Frame), GPI Freeze, Variable Strobe, Forced Monochrome and Advanced Sync, All video proc amp functions, system timing, scene memories and color balance can be adjusted by the front panel controls or with DPS-235 software.

Why Are TBCs Necessary?

A TBC is a necessary piece of video production hardware because time base errors (the video equivalent of audio wow and flutter) are inherent in mechanical video storage devices such as video tape recorders. The primary function of a TBC is to correct these playback errors that occur due to the elasticity of the recording medium and the mechanical movement of the motors, guides and rollers. Such errors create differences in the length and position of the individual horizontal lines which comprise a complete video frame, preventing the various picture elements from lining up precisely. You will not be able to see time base error on a monitor since the effect is only noticed in video switchers and recording equipment.

Perhaps of more interest to the average video producer is the fact that non-time base corrected VCRs cannot be mixed with other sources in a video production switcher. In order to produce transitions such as dissolves and wipes between two or more video signals without objectionable picture tearing or rolling, the relative timing of each signal must be precisely synchronized. Stable, genlockable video sources such as cameras and graphics systems can easily be timed into a production switcher, but VCRs require a TBC to provide the missing link to accomplish this task.

Time base correction is done electronically by digitizing or sampling the video picture as it comes from the recorder, storing this digital information momentarily and then reconstructing it into an error free analog image. Video is clocked out of the TBC memory according to a stable timing reference provided by an external genlock signal or by an internal TBC sync generator. Once corrected, the video can safely be broadcast, used for editing or combined with other sources in a video production switcher.

The larger the size of the correction window, the greater the ability of the TBC to correct for gross variations such as gyroscopic errors that result from abrupt movements of the tape machine during recording. The digital memory of the DPS-235 has three fields (or 1½ frames) and can store more than 525 lines of video and is therefore considered a full frame or infinite window device. A full frame TBC provides other advantages including freeze frame effects and the ability to work with virtually any VCR. Because the DPS-235 can store an entire frame of video, a one wire connection is possible between the VCR and the TBC. This eliminates the need to feed external sync from the TBC to the VCR and enables the DPS-235 to work with a wide range of professional, consumer and prosumer VCRs.

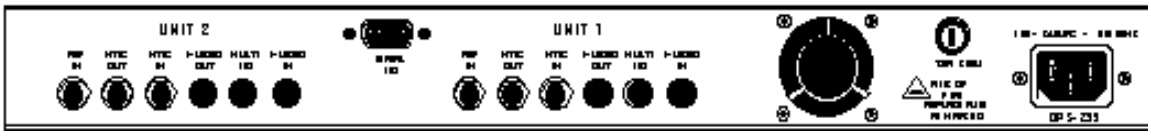
CHAPTER 2

Video Connections

This section describes how to interface the Personal TBC IV card with other video equipment in your system. Figure 5-1 shows the location and function of the Personal TBC card I/O connectors and switches.

Figure 1-1

DPS-235 Rear Panel



S-Video Input

This 4-pin connector is used to input S-Video (S-VHS or Hi8) to the TBC card. It is normally connected to the S-Video output of a playback VCR using a standard 4-pin to 4-pin S-Video cable. Some JVC industrial type S-VHS players use a 7-pin connector for their S-Video output. To interface with such machines, a 7-pin to 4-pin adapter cable is required.

Multi Function I/O (DIN-9)

This connector is used to access the GPI pin and places the TBC into freeze if activated. Use the supplied breakout cable (RCA jack).

The multi-function DIN-9 connector may also be used as an advanced sync output by connecting the supplied breakout cable, and using the advanced sync BNC (Gray Wire). The advanced sync signal can then be fed to the EXT SYNC input of a suitably equipped playback VCR.

S-Video Output

This 4-pin connector provides the time base corrected S-Video (S-VHS or Hi8) version of the video input signal.

NTSC Video Input

This BNC connector is used to feed composite NTSC video to the TBC. It is normally connected to the video output of a playback VCR. It can also be connected to any composite NTSC source such as a TV tuner, laser disc player, camera, etc.

NTSC Video Output

This BNC connector provides a timebase corrected version of the video input signal.

Genlock OK LED

This LED will light when a valid genlock video signal is connected to the TBC genlock video input.

Genlock Video Input

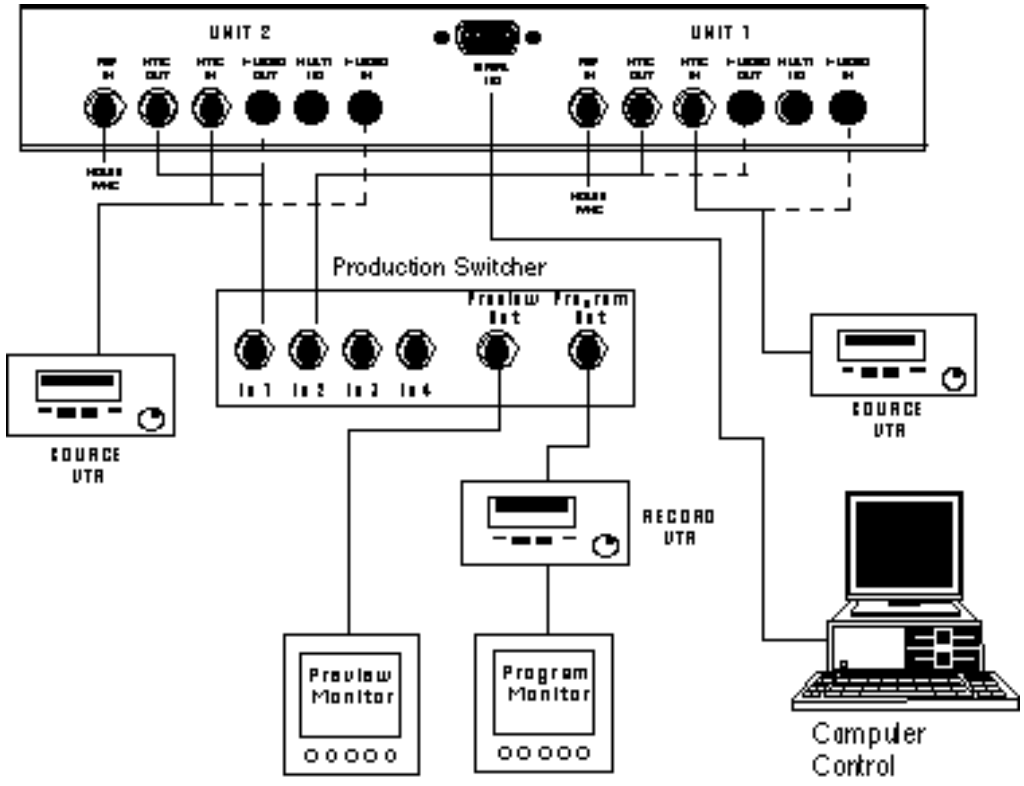
The genlock video input is used by the TBC to establish the timing for its video output signal. The signal connected to this input must always be STABLE, such as the output from a black burst or color bar generator. DO NOT attempt to use a non-time base corrected VCR for your genlock reference. When a valid signal is connected to this input, the video output of the TBC will be co-timed (genlocked) to this signal and the rear panel genlock OK LED will light. When no external reference is supplied to the genlock input, the TBC IV will operate using tis internal sync generator. If the genlock reference is to be looped to another device, this must be done using the provided BNC Y cable DPS part #774-517.

Interfacing Example

The following example illustrates the correct method of interfacing the DPS-235 card to several different types of video sources. The output of the TBC card is shown connected to a production switcher/effects unit in that all of its video inputs MUST be time base corrected and co-timed (genlocked).

Figure 1-2

Interfacing the DPS-235

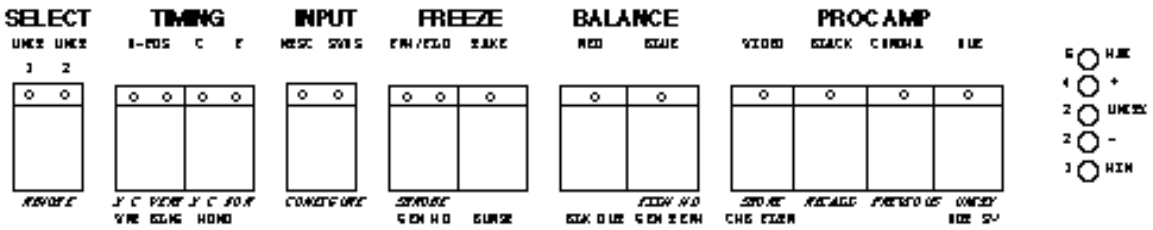


CHAPTER 3

Operation

Figure 2-1

DPS-235 Front Panel Controls



This section describes the front panel controls and indicators for the DPS-235 dual channel TBC.

The SELECT button is used to address the individual channels installed in the UNIT 1 and UNIT 2 positions. After selecting a desired channel, the front panel indicators will display the selected card parameters. The momentary push button switches on the DPS-235 front panel are used to select the various operating modes. Changes to a mode setting (eg, Video Level) are performed by pressing the appropriate button (eg, Video) and then rotating the shaft encoder knob. The bar graph display, located to the left of the shaft encoder, provides a relative measure of the selected setting.

There are three control functions associated with some push-buttons. The primary functions are in Black. The secondary functions are in Blue and the shift functions are in Italic.

UNIT SELECT

The UNIT select button is used to address the selected installed channel. Whenever UNIT 1 is selected, all of the front panel controls and indicators display the current parameters of the TBC in the UNIT 1 position, and when UNIT 2 is selected the front panel controls and indicators display the current parameters of the TBC in the UNIT 2 position. This button is also used to select remote/local operation.

UNIT 1

When this button is selected, the DPS-235 will recall and display the current status of the TBC that is in the UNIT 1 position. A flashing UNIT 1 LED indicates that the installed TBC is not responding to the DPS-235 commands.

UNIT 2

When this button is selected, the DPS-235 will recall and display the current status of the TBC that is in the UNIT 2 position. A flashing UNIT 2 LED indicates that the installed TBC is not responding to the DPS-235 commands.

REMOTE

The remote function causes the DPS-235 to go into remote mode. The unit can now accept commands from a remote source such as a computer or a remote control module. The commands are accepted via the rear panel s DB-9 female connector, and are processed by the front panel and echoed to the selected UNIT.

This function is activated by holding in the SELECT button for approx 1 sec., when this function occurs, the front panel UNIT 1 and UNIT 2 LED s will both be on. To select local mode simply press the UNIT 1/UNIT 2 button once.

PROC AMP CONTROLS

Video Level

This button selects video level control for the shaft encoder. Changing the video level effects the overall amplitude of the processed video signal, resulting in a change in the displayed picture contrast.

Black Level

This button selects black level control for the shaft encoder. Changing the black level effects the DC level of the processed video signal, resulting in a change in the displayed picture brightness.

Chroma Level

This button selects chroma level control for the shaft encoder. The chroma level control changes the color saturation of the processed video signal.

Hue Level

This button selects hue level control for the shaft encoder. The hue control changes the phase of the processed color subcarrier, which effects the tint of the displayed picture.

MEMORY FUNCTIONS

The store function causes the current proc. amp settings, including color balance and horizontal position, to be saved in non-volatile memory in the DPS-235. These settings may later be recalled using the recall function. This function is activated by holding in the Video button for approx 1 sec. When this function occurs, the front panel proc amp LEDs will flash.

Memory Recall Function

The recall function is used to recall settings previously stored using the store function. This function is activated by holding in the BLACK button for approx. 1 sec. When this function occurs, the front panel proc amp LEDs will flash for one second.

Memory Previous Function

The previous function is used to return the proc amp settings to those present before a memory recall or unity function. This function is activated by holding in the CHROMA button for approx 1 sec. When this function occurs, the front panel proc amp LEDs will flash for one second.

Memory Unity Function

The unity function returns all proc amp, and color balance settings to the factory preset values. This function is activated by holding in the HUE button for approx 1 sec. When this function occurs, the front panel proc amp LEDs will flash for one second.

COLOR BALANCE CONTROLS

The Color Balance controls are labeled BALANCE on the front panel are used to change the white balance of the processed video signal on the selected TBC channel. They can be used to correct for footage shoot with improper white balance, or used to add a color wash as a special effect.

Red

This button selects R-Y color balance control for the shaft encoder. Changing the R-Y color balance has the effect of adding/subtracting red to the processed video signal.

Blue

This button selects B-Y color balance control for the shaft encoder. Changing the B-Y color balance has the effect of adding/subtracting blue to the processed video signal.

Film Mode

This feature simulates the 3-2 pull down conversion technique from a 24 frame per second film standard, to a 30 frame per second video standard. This function is activated by holding in the Blue button for approx 1 sec. When this function is engaged, RED balance and ProcAmp functions are available for adjustment. While in this mode, the blue and take LEDs will flash. To exit this mode, press the blue button again.

FREEZE CONTROLS

Take

The Take button used to toggle between freeze and live modes. Note that when the selected unit is in the freeze field mode, and the freeze function is activated, the shaft encoder may be used to select 1 of the 3 fields captured when the freeze function was actuated.

FRM/FLD

This button is used to select between frame (FRM) and field (FLD) freeze modes. The frame mode is normally used for static scenes (ie no motion) because it provides better vertical resolution. The field mode is used to freeze scenes that contain motion. When a TBC card is installed, the shaft encoder can be used to select field 1, field 2, or field 3.

Strobe Function

The strobe function is engaged by pressing and holding the freeze FRM/FLD button until the FRM LED begins to flash. The strobe mode is then entered when the freeze Take button is selected. When the unit is in strobe mode, the shaft encoder may be used to select the desired strobe rate.

SYSTEM TIMING CONTROL

The genlock controls are used to modify the timing of the video outputs from the selected channel, so that correct system timing is maintained when the unit is used in conjunction with other video processing equipment. When a reference video signal is connected to the selected TBCs reference video input, the outputs from that card will nominally be co-timed with this signal. Using the genlock controls, the selected units output video may be shifted with respect to the reference video input.

Genlock Timing

This button enables the horizontal genlock timing to be changed via the shaft encoder. The Course C genlock timing moves the output video signal in steps of 270 nsec, or 360 degrees. A flashing C LED indicates that the selected unit is not genlocked.

The Fine F button enables the fine genlock timing to be changed via the shaft encoder. The fine genlock timing moves the output video in steps of 0.55 nsec or 0.70 degrees. A flashing subcarrier F LED indicates that the selected unit is not genlocked.

To disable accidental genlock timing adjustments or to terminate the input reference signal, see configuration options later in this chapter. If genlock adjust is disabled, no timing adjustments can be made until it is re-enabled.

This button can be used to adjust the Y/C Horizontal Delay. This is achieved by pressing & holding the C-F button down until it s led s flash. Then rotate the shaft encoder to adjust the Y/C delay. This function affects only the TBC IV card.

Horizontal Position

This button enables the horizontal position of the video signal to be adjusted +/- 1 us by using the shaft encoder.

This button can be used to adjust the Y/C Vertical Delay. This is achieved by pressing & holding the H POS button down until it s leds flash. Then rotate the shaft encoder and set the Bar graph led to one of four positions.

INPUT SELECT

The INPUT SELECT button functions as an NTSC/ S-VID select button as when the NTSC Led is lit, the NTSC input for the selected channel is active. If the S-VID Led is lit, the S-Video input for the selected channel is active. If an input is selected that has no connection on the rear panel input, the LED appropriate to that input will flash.

CONFIGURATION OPTIONS

Each TBC channel can be configured with a number of setup modes. In order to change a setup mode, you must perform the following steps:

1. Choose the desired TBC channel using the UNIT 1/UNIT 2 SELECT button.

2. Place the unit into CONFIGURATION SELECT mode by pressing the NTSC/S-VHS INPUT button so that the NTSC and S-VID LEDs are flashing

3. In configuration mode, each button takes on a new function. Select the desired configuration function by pressing the appropriate button. Configuration functions are located below the buttons and are labeled in blue.

4. Choose a mode for the selected configuration function by turning the rotary shaft encoder knob. Modes are indicated by the number (1-5) legends located to the left of the LED level display. The default value for each setup mode is 1 . The following table details the various configuration function choices.

Remember, after changing one or more of these configure modes, the unit will remain in Configuration mode until you press the Configure button to return the unit to normal operation. Once the configure LED s are extinguished, the buttons return to their primary functions which are denoted by the black legends located above each button.

Configuration Functions (Factory Default is 1)

Button	Function/ Mode
VRT BLKG	Vertical Blanking Width 1. Narrow 2. Wide
MONO	Monochrome Mode 1. Normal 2. Forced Monochrome
GEN MD	Genlock Adjust 1.Genlock Adjust Enable 2. Genlock Adjust Disable
BURST	Output Burst Mode 1. On 2. Off
BLK OUT	TBC Function 1. Normal 2. Super Black Out
GEN TERM	Genlock Termination 1. High Impedance 2. 75 terminated
CMB FLTR	Chroma Filter/Comb Filter 1. Chroma On/Comb Filter Off 2. Chroma Off/Comb Filter Off 3. Chroma Off/Comb Filter On
HOT SW	Hot Switch Mode 1. Disable 2. Enable

NON-VOLATILE MEMORY

The DPS-235 stores all current settings, such as Proc-amp levels and system timing in its own non-volatile memory. The memory is automatically updated once every three seconds. These settings are automatically recalled and transferred to the resident TBC channels on power up, so that system timing and Proc-amp levels are not lost. System timing information is stored separately for each resident channel. Proc-amp levels are stored with respect to each channel.

APPENDIX A

Specifications

Video Input (NTSC mode) ..... 1V p-p
Y Input (S-Video mode) ..... 1V p-p
C Input (S-Video mode) ..... 286mV p-p burst level
Reference Video Input ..... 1V p-p
Video Output (NTSC mode) ..... 1V p-p
Y Output (S-Video mode) ..... 1V p-p
C Output (S-Video mode) ..... 286mV p-p burst level
Advanced Sync Output ..... 2V p-p
Bandwidth
- (NTSC mode) ..... 5 MHz
- (S-Video mode) ..... 5 MHz

Correction Window ..... Infinite
Signal-to-Noise ..... >58dB
Differential Phase ..... <2
Differential Gain ..... <2%
K Factor:
- Y/C Input 1%
- NTSC Input 3%

Residual Time Base Error ..... <15nS
Serial Data Input ..... RS-232 Levels @ 31.25 or 9.6 kB/s
Proc Amp Controls:
- Video Level ..... +/- 3dB
- Black Level ..... +/- 20 IRE
- Chroma Level ..... -40 to + 6dB
- Chroma Phase (Hue) ..... +/- 45
- Horizontal Pos ..... +/- 1 s

Color Balance:
- R-Y Shift ..... +/- 20%
- B-Y Shift ..... +/- 20%

Specifications (continued)

Y/C Delay:
- Horizontal ..... -560ns to +490ns
- Vertical ..... -2 lines to +1 line

Genlock Timing:
- Horizontal ..... +/- 4 s
- Subcarrier ..... +/- 360

Power Requirements ..... 8.4 Watts
- Input Voltage ..... 100-240 VAC 50/60 Hz
- Input Power ..... 40 Watts Maximum (Two Channels Installed)

Fuse Replacement 4A 230V

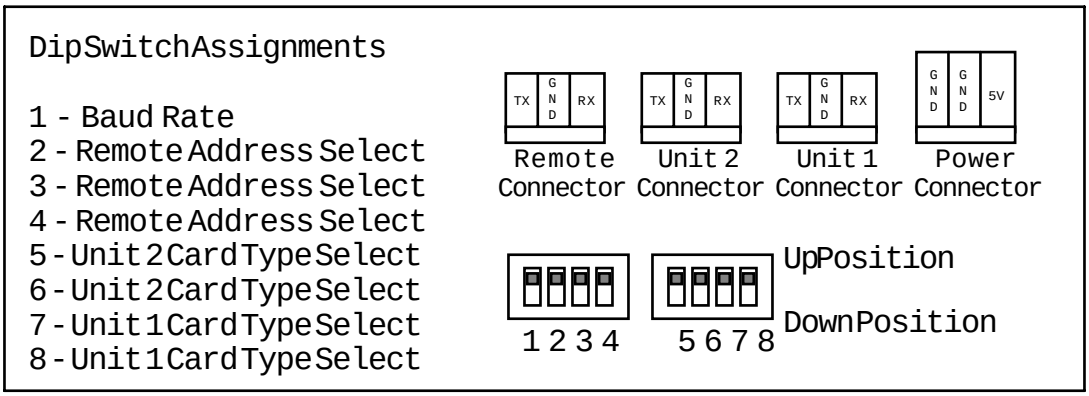
APPENDIX B

Installing a Second TBC Channel

If your DPS-235 was equipped with a single channel from the factory, a second channel may be added using the following procedure. In the interest of personal safety, refer service to qualified personnel.

Figure B-1

DPS-235 Front Panel DIP Switch Assignments



Disconnect the power cord from the DPS-235 and remove the top cover.

Place dip switches 2, 3, 4 and 5 on the card intended for the vacant slot in the DPS-235.

Refer to figure B-1 and check that the DPS-235 front panel DIP switches are in the following positions.

1. UP
2. UP
3. UP
4. UP
5. DOWN
6. DOWN
7. DOWN
8. DOWN

Install the 3-wire RS-232 cable for unit 2 to the 3-pin header labeled INPUT at the top of the TBC card near the BNC connectors.

Press the power supply edge connector for unit 2 onto the TBC card as far as it will go.

Mount the TBC card in the channel 2 position using the five screws provided and install the supplied hardware for the rear panel support bracket.

Replace the top cover.

APPENDIX C

Remote Control

There are three possible methods of remote controlling the units installed inside a DPS-235 (or multiple DPS-235s). The first method is to use DPS developed computer software and to remote control the DPS-235 from a Personal computer or an Amiga computer. The second is to use a DPS desk top remote control, the RC-2000. The third method would require that the user develop their own custom remote software based on the protocol provided in Appendix D.

DPS Computer Software
Computer Software available in two versions, one for AMIGA computers and the other for IBM compatible PC s.

The user must set the DPS-235 remote address to same address of the card installed in the UNIT 1 slot. If it is desired to control more than one DPS-235, then the cable that connects the computers serial port to the first DPS-235 must also connect all other DPS-235s to the computer s transmit and ground lines. In other words, the computers transmit and ground line must be daisy chained to all of the DPS-235s in a system. Figure C-3 shows multiple DPS-235s connected together. The use of flat ribbon cable and insulation displacement DB-9 connectors can facilitate a multi unit installation.

After installing the software in the computer, set the computer s Baud rate to 9600 BPS. (In the case of a PC the remote software automatically configures the PC to 9600 Baud), then connect the computer s serial port to the DPS-235. The user must provide the connecting cable. The DPS-235 has a DB-9 female connector that accepts RS-232 levels, which can be connected to the computer s serial port directly. Figure C-1 shows the pin-out of the DPS-235 remote port. Before attempting to remote control the DPS-235, make sure that the front panel of the DPS-235 has full control of the cards installed inside it. This will assure that the communication between the DPS-235 and it s resident cards is correct.

If you have only one DPS-235, then the factory preset is the correct address (DIP switches 2,3,4 up), However if you have more than one DPS-235 to be remoted, always set the address of the DPS-235 to the same address as the card in the UNIT 1 slot. Also all cards inside the DPS-235 must have a unique address (except for V-Scope cards). It is important that every DPS-235 has the same address as the card installed in the unit 1 position.

To Place the DPS-235 in remote mode, press and hold the REMOTE button down for 1 second. Both UNIT 1 and UNIT 2 LED s will now be on. The DPS-235 is now ready to be remoted. Always remember to set the baud rate of the computer, DPS-235, and the cards inside the DPS-235 to the same baud rate.

Run the software on the computer. The DPS software screen should appear on the computer screen (IBM or AMIGA). The software will now allow the user to send commands to the cards that are installed inside the DPS-235. The Maximum number of TBCs that can be controlled by the software is eight (8).

There are three rules that must be followed when setting a card address inside a DPS-235

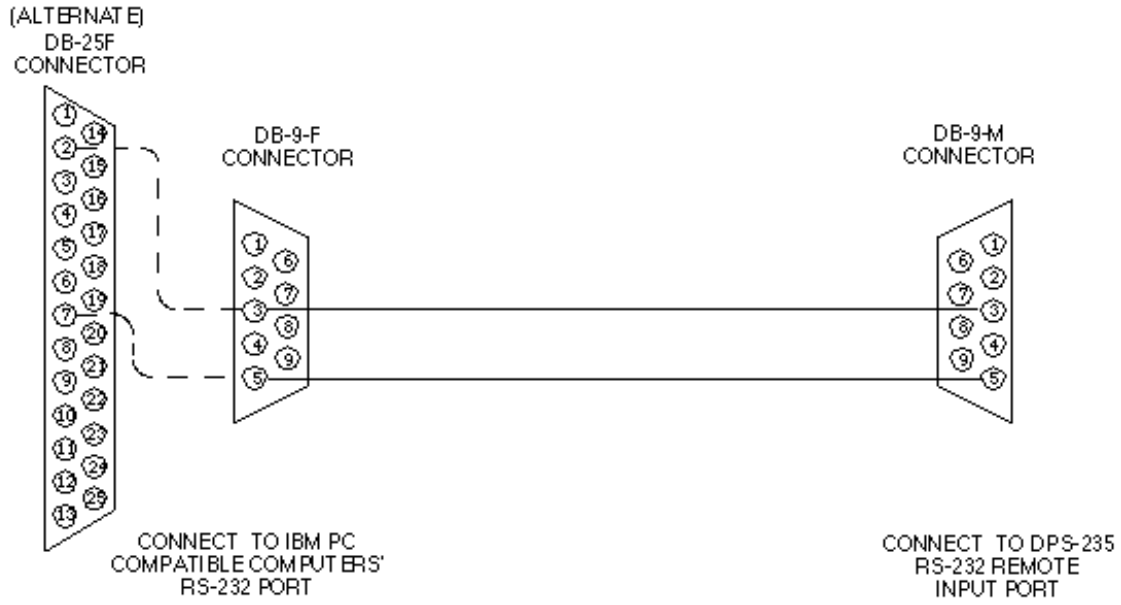
1. The Address of the DPS-235 must be set to the same address as the card installed in the UNIT 1 slot. This can be accomplished by setting DIP Switches 2, 3 & 4 on the DPS-235 front panel in same direction as DIP Switches 3, 4 & 5 on the card installed in the UNIT 1 slot

2. The address of the card installed in the UNIT 2 slot must be one address greater than that of the card installed in the UNIT 1 slot.

3. The Baud rate of the all the cards and of the DPS-235 front panel should be the same. The Default factory setting is 9600 BPS.

Figure C-1

Computer to DPS-235 Cable Assembly



TBC Card Addresses (Switches 3, 4 and 5)

Switch-3	Switch-4	Switch-5	TBC IV Unit ID
UP	UP	UP	1st TBC
DOWN	DOWN	DOWN	2nd TBC
DOWN	DOWN	UP	3rd TBC
DOWN	UP	DOWN	4th TBC
DOWN	UP	UP	5th TBC
UP	DOWN	DOWN	6th TBC
UP	DOWN	UP	7th TBC
UP	UP	DOWN	8th TBC

RC-2000 Remote Control

The DPS RC-2000 desktop remote is capable of controlling up to four DPS--235s. The RC-2000 takes the place of the host computer s serial port and connects directly to the DB-9 connector at the DPS-235 rear panel. Power for the RC-2000 is provided by an external AC adapter.

All video proc amp, timing functions, and setup memories can be accessed via the RC-2000 s front panel controls. When using an RC-2000, set the DPS-235 into remote control mode and ensure that the RC-2000 and the DPS-235 are set to the same baud rate. Please refer to the RC-2000 instruction manual for specific instructions regarding its use. The user must provide their own remote cable to connect the RC-2000 RS-232 port to the DPS-235 RS-232 remote control port as shown in Figure C-2.

Figure C-2

RC-2000 to DPS-235 Cable Assembly

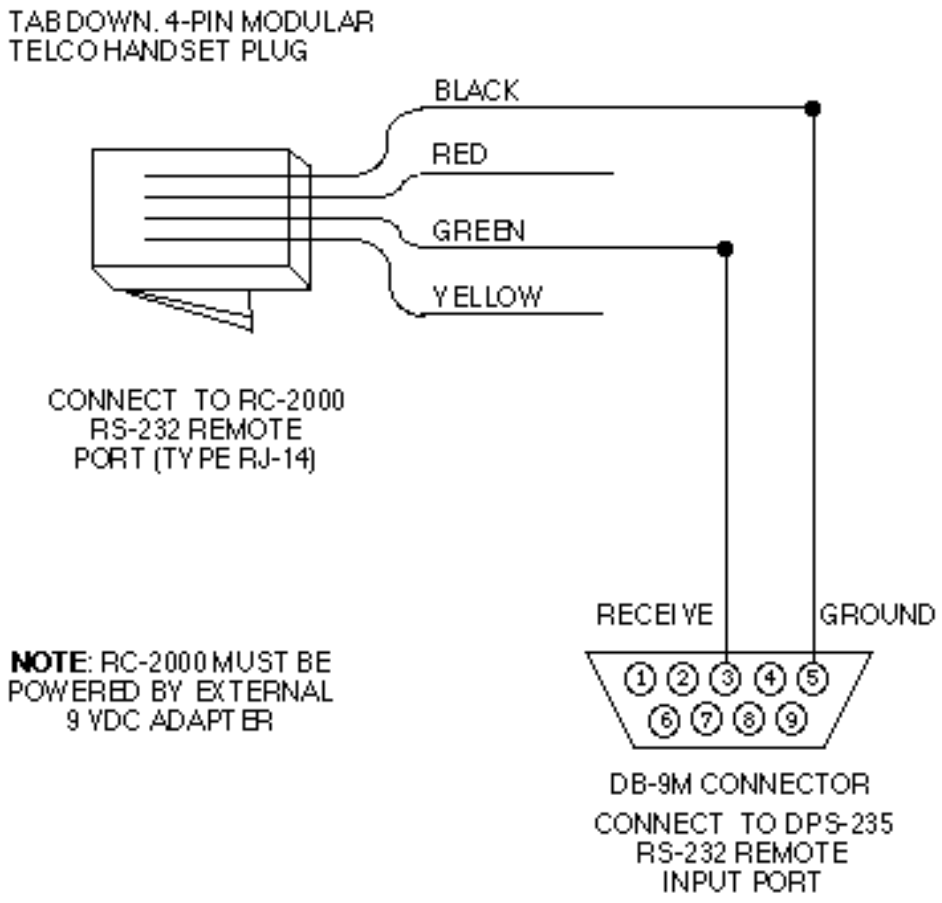


Figure C-3

Two DPS-235s Under Remote Control

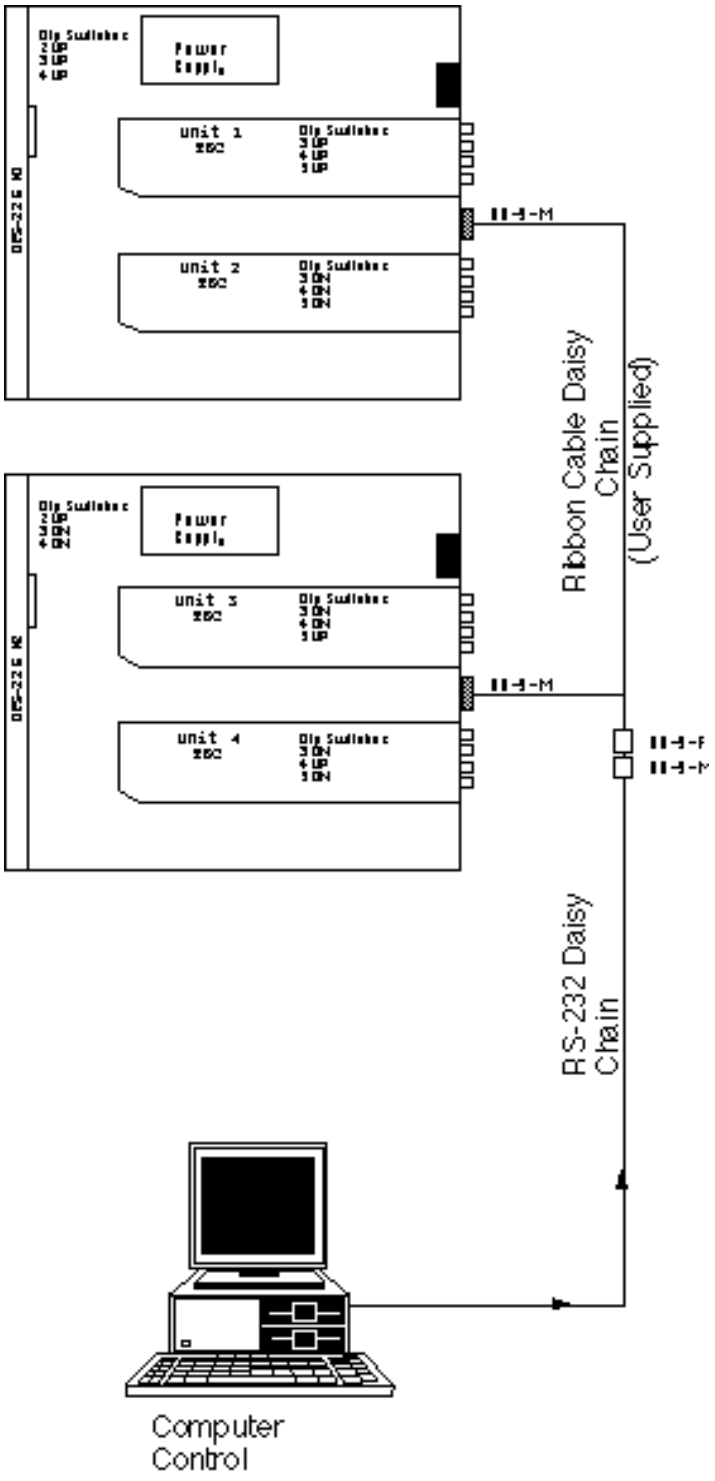
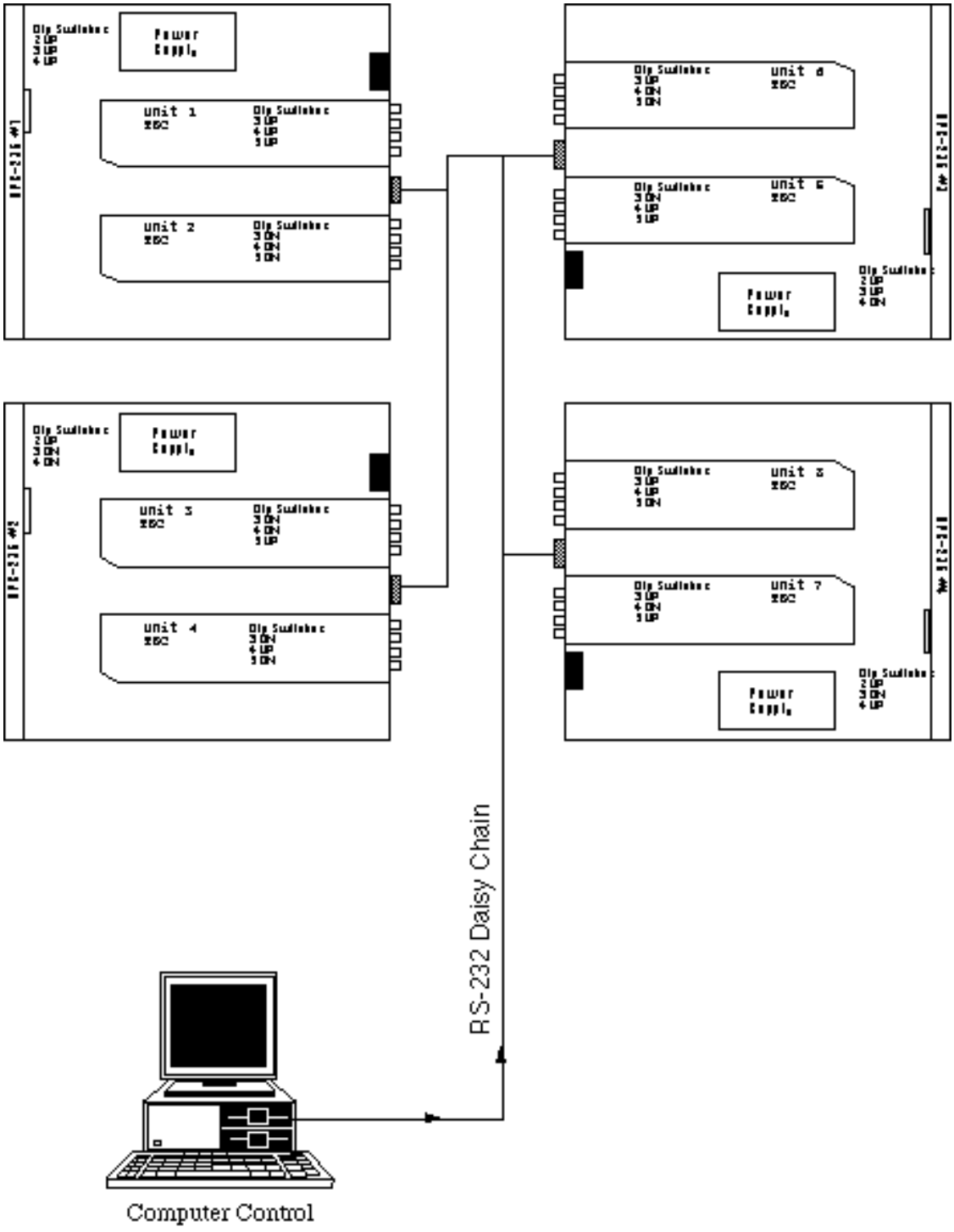


Figure C-4

Four DPS-235s Under Remote Control



APPENDIX D

DPS-235 Serial Protocol

This appendix describes the serial data interface to the DPS-235. This information is not normally required since the DPS-235 Amiga and MS-DOS software programs provided with the unit are typically used to control the DPS-235. This information is intended for users and programmers who want to develop their own custom control (driver) software for the unit. An example of a custom application would be a special driver for a computer-based editing controller which could poll and manipulate TBC proc amp parameters in order to store these values as part of an edit decision list.

The TBC cards installed in the DPS-235 are equipped with a jumper (labeled "MT/TX") which normally forces the RS-232 transmit data output to be high impedance. This permits other applications to use the RS-232 port on an Amiga computer. The DPS-235 Amiga program uses a one-way communications design and does not make use of the TBC cards command responses (usually ACK characters). If you want to use two-way protocol, the transmit data control jumper on the cards must be moved to the "TX" position. This will allow certain types of status data to be transmitted from the cards to your application.

Electrical Interface

The electrical interface for the DPS-235 is RS-232 using a computer's built in RS-232 port or any other RS-232 port which may reside on an expansion card. The bit rate is set to 31,250 BPS or 9600 BPS (DIP switch selectable, using DIP switch 2 on the cards DN = 9600, UP = 31,250), with 8 data bits, 1 stop bit and no parity.

Protocol

The software protocol is a MIDI compatible format, using the system exclusive feature of the MIDI interface. Communication with the cards are initiated when the system exclusive command byte (F0 hex) is received, followed by the TBC ID code (67 hex).

The next byte sent is the TBC address byte, which determines which TBC is being addressed by the command. This is followed by a TBC function select byte and one or more data bytes. The communication is completed when the MIDI end system exclusive byte is sent (F7 hex).

The following table summarizes the protocol:

Host:

System Exclusive Byte (= F0 hex)
TBC ID Byte (= 67 hex)
TBC Address Byte (= 00-7F hex)
Function Select Byte (= 00-7F hex)
Data Byte 1
Data Byte 2
-
Data Byte N
End System Exclusive (= F7 hex)

TBC Response:

ACK Byte (= 40h) or NACK Byte (= 45h)

System Exclusive Byte

This byte is used in the MIDI protocol to allow manufacturers of MIDI equipment to define messages specific to their own equipment. The system exclusive mode remains in effect until the end system exclusive command is sent.

TBC ID Byte

This byte is the unique code which identifies the exclusive data for the particular TBC.

TBC Address Byte

This byte determines to which TBC unit the following command is directed. Each TBC card is equipped with a DIP switch which determines its address according to the table below.

Address Byte	DIP SW-3	DIP SW-4	DIP SW-5
00	DOWN	DOWN	DOWN
01	DOWN	DOWN	UP
02	DOWN	UP	DOWN
03	DOWN	UP	UP
04	UP	DOWN	DOWN
05	UP	DOWN	UP
06	UP	UP	DOWN
40	UP	UP	UP (Master)
7F	All (Acked by master only)		

Note that the last entry in the table selects all TBCs. This allows the parameters of all installed TBCs to be simultaneously updated. If used, this command will be acknowledged by the master TBC only. Normally, when an individual TBC is addressed, the command will be acknowledged by that TBC.

TBC Function Select Byte/Data Byte(s)

The Function byte determines which function on the addressed TBC card will be affected by the command. Most commands follow this byte with two characters that represent the new hex value for the selected function. The following table lists each function with the associated data bytes.

TBC Function Select Byte/Data Byte(s)

Function Byte	Data Byte(s)	Description
01h	2 (0,0-F,F)	Set luminance level command 00 = Minimum luminance level FF = Maximum luminance level
02h	2 (0,0-F,F)	Set black level command 00 = Minimum black level FF = Maximum black level
03h	2 (0,0-F,F)	Set chroma level command 00 = Minimum chroma level FF = Maximum chroma level
04h	2 (0,0-F,F)	Set hue command 00 = Max counter clockwise FF = Max clockwise
05h	2 (0,0-F,F)	Set genlock timing fine 00 = Most retarded setting FF = Most advanced setting (0.55 ns/increment)
06h	2 (0,0-3,F)	Set genlock timing horizontal 00 = Most retarded setting 3F = Most advanced setting (140 ns/increment)
07h	2 (0,0-F,F)	Set Horizontal position 00 = Most retarded setting FF = Most advanced setting

Function Byte	Data Byte(s)	Description
08h	1 (0-1)	Input mode select 0 = NTSC input mode 1 = S-Video input mode
09h	8	Set all proc amps
0Ch	1 (0-1)	Freeze/Live mode select 0 = Live mode 1 = Freeze mode
0Dh	0	Request TBC brief status info.
0Eh	0	Request TBC full status info
10h	2 (0,0-F,F)	Set Blue color balance 00 = Most neg blue 80 = No blue FF = Most pos blue
11h	2 (0,0-F,F)	Set Red color balance 00 = Most neg red 80 = No red FF = Most pos red
12h	2 (0,0-7,F)	Strobe Rate 00 = Full Motion 7F = 127 Frames
13h	1 (0-4)	Select Freeze Mode 0 = Frame mode 1 = Field mode 2 = Strobe mode 3 = 4 Field mode 4 = Film mode

Function Byte	Data Byte(s)	Description
14h	1 (0-2)	Freeze Field Select 0 = Select field 0 1 = Select field 1 2 = Select field 2
16h	1 (0-F)	Y/C Delay horizontal 0 = +570nS 8 = 0 F = -490nS
24h	1 (0-3)	Y/C Delay vertical 0 = +1 line 1 = 0 2 = -1 line 3 = -2 lines

Function Byte	Data Byte(s)	Description
35h	2	Set control flags - 1
		Bit 0 Input mode
		0 = NTSC
		1 = S-Video
		Bit 1 Mono/Color mode
		0 = color
		1 = mono
		Bit 2 Chroma Filter
		0 = on
		1 = off
		Bit 3 Genlock Term.
		0 = open
		1 = 75
		Bit 4 Vertical Blanking
		0 = narrow
		1 = wide
		Bit 5 Genlock mode
		0 = internal
		1 = external
		Bit 6 Hot Switch
		0 = disable
		1 = enable
		Bit 7 Output Burst enable
		0 = on
		1 = off

Function Byte	Data Byte(s)	Description
36h	2	Set control flags - 2
		Bit 0 Force Black
		0 = Process
		1 = Black
		Bit 1 Strobe Mode
		0 = Hyst Enabled
		1 = Old Way
		Bit 2 GPI Enable
		0 = Enabled
		1 = Disabled
		Bit 3 Echo Mode
		0 = Disable
		1 = Enable
		Bit 4 Beta/MII
		0 = Beta
		1 = MII
		Bit 5 Luma N/R
		0 = Off
		1 = On
		Bit 6 Chroma N/R
		0 = disable
		1 = enable)
		Bit 7 Comb/Notch Fltr
		0 = Comb
		1 = Notch

Proc Amp Control

The first four commands will be used most often. They allow each of the TBC proc amp functions to be individually manipulated.

Genlock Timing

Commands 05 and 06 are used to adjust the genlock timing of the TBC card. When the genlock timing subcarrier control is incremented from FFh - 00h, the horizontal control should be incremented to maintain a continuous control effect. Similarly, when the subcarrier setting is decremented from 00h - FFh, the horizontal control should be decremented. Whenever the genlock timing is to be adjusted, the TBC status should be read (see command 0Ah) to ensure that the addressed TBC is in genlock mode. The system phase is not significant when the TBC is in free-running mode.
The genlock timing control on the TBC card adjusts BOTH horizontal (i.e. sync timing) and subcarrier phase simultaneously in such a manner as to ALWAYS maintain a zero SCH relationship at the TBC video output. This is unlike some equipment which permits separate sync and subcarrier adjustments. The correct adjustment procedure is to first obtain the closest possible horizontal phasing. (Typically a waveform monitor or DPS Personal V-Scope would be used. Lacking a calibrated waveform monitor, the adjustment can be performed using a split monitor)
Horizontal phasing should be done by incrementing/decrementing the genlock timing horizontal setting in steps of 2 (2 x 140 ns = 1 subcarrier cycle) which will move the picture without changing the color phasing.

The subcarrier setting and the LSB of the horizontal setting can now be adjusted for correct color phase. If this adjustment is performed without a vectorscope (i.e. by observing the color phase on a picture monitor), it is important that the TBC hue setting first be centered (Set to 80h) so that correct system timing is achieved.

Horizontal Position

The horizontal position control moves the active video portion of the picture without affecting the output sync and burst. When proper genlock timing is set, this control can be used to move the active video portion of the signal as may be required for certain editing situations. This control should be set to unity (80 hex) when the system phase is manipulated.

Brief TBC Status

Command 0D is used to request status information from the TBC. The TBC responds with the following status byte (followed by the normal ACK byte).

Bit 7	Always 0	
Bit 6	(Genlock Status)	1 = Genlocked 0 = Free-running
Bit 5	(Input Video Pres)	1 = Input present 0 = No Input present
Bit 4	(Freeze/Live Mode)	1 = Freeze mode 0 = Live mode
Bit 3-0	(Software Version ID)	

Full TBC Status

Command 0Eh requests a complete status dump from the addressed TBC. The status information consists of the brief status byte (see command 0Dh), followed by two ASCII characters for each of the proc amp and system phase settings. These represent the hex value of their current setting as indicated.

Byte	Description
1	Brief status byte (see command 0Dh)
2	MSN of Video Level
3	LSN of Video Level
4	MSN of Black Level
5	LSN of Black Level
6	MSN of Chroma Level
7	LSN of Chroma Level
8	MSN of Hue Level
9	LSN of Hue Level

Full TBC Status Continued...

Byte	Description
10	MSN of Subcarrier System Phase
11	LSN of Subcarrier System Phase
12	MSN of Horizontal System Phase
13	LSN of Horizontal System Phase
14	MSN of Horizontal Position
15	LSN of Horizontal Position
16	Control Flags-1
17	Control Flags-2
18	MSN of Blue Color Balance
19	LSN of Blue Color Balance
20	MSN of Red Color Balance
21	LSN of Red Color Balance
22	TBC ACK byte

Note: MSN = Most Significant Nibble (ASCII 0 - 9 or A - F)
LSN = Least Significant Nibble

Programming Example

Some confusion has resulted from the fact that actual data bytes sent to the TBC card must be in ASCII. The following is an example of the actual data that would be sent to the TBC IV card to force it into monochrome mode. Please note that the data bytes are always transmitted in ASCII.

0xF0	MIDI Start of Exclusive
0x67	DPS ID
0xAA	AA = TBC Address
0x37	Forced Monochrome Function Select
0x31	= ASCII for 1
0xF7	MIDI End of Exclusive

Note: All TBC settings are maintained upon power down in non- volatile memory on the TBC card.

APPENDIX E

FCC Compliance Statement

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.

2. This device must accept any interference received, including interference that may cause undesired operation.

Notes:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

Warning:

Changes or modifications to this unit not expressly approved by Digital Processing Systems, Incorporated could void the user's authority to operate the equipment.

APPENDIX F

Warranty

Digital Processing Systems Inc. warrants the original purchaser that this product is in good working condition for a period of two years from the date of purchase. Should this product, in Digital Processing System s opinion, malfunction within the warranty period, Digital Processing Systems Inc. will repair or replace this product without charge. This warranty does not apply to those products which have been damaged due to accident, unauthorized alterations, repairs or modifications.

Limitations

All warranties for this product, expressed or implied, are limited to two years from the date of purchase and no warranties, expressed or implied, will apply after that period.

The distributor,its dealers and customers agree that Digital Processing Systems Inc. shall not be liable for any loss of use, revenue or profit.

Digital Processing Systems Inc. makes no other representations of warranty as to fitness for purpose of merchantability of otherwise in respect to any of the products sold to the distributor pursuant to this agreement.

The liability of Digital Processing Systems Inc. in respect of any defective products will be limited to the repair or replacement of such products.

In no event shall Digital Processing Systems Inc. be responsible or liable for any damages arising from the use of such defective products whether such damages be direct, indirect, consequential or otherwise and whether such damages are incurred by the distributor or third party.

Warranty Service

Units requiring repair under warranty may be sent directly to Digital Processing Systems Inc. To obtain service under this warranty, first contact the Digital Processing Systems Customer Service Department to request a Return Material Authorization Number (RMA).

Canada and International	(416) 754-8090
U.S.A.	(606) 371-5533
Europe	(0252) 718300

This number must be clearly displayed on the units external packaging. Units shipped without an RMA number will not be accepted. Include proof of purchase (including date of purchase), a note outlining the problem and the RMA number.

IMPORTANT: When shipping your unit, pack it securely and ship prepaid and insured. Digital Processing Systems Inc. will not be held liable for damage or loss to the product in shipment. Repaired items will returned to the purchaser prepaid via a surface freight carrier of DPS choice within the continental United States. If another method of shipping is desired, it must be clearly specified in writing and all priority return freight charges are the responsibility of the purchaser.